

Stronger selection can slow down evolution driven by recombination on a smooth fitness landscape

Stronger selection implies faster evolution—that is, the greater the force, the faster the change. This apparently self-evident proposition, however, is derived under the assumption that genetic variation within a population is primarily supplied by mutation (i.e. mutation-driven evolution). Here, we show that this proposition does not actually hold for recombination-driven evolution, i.e. evolution in which genetic variation is primarily created by recombination rather than mutation. By numerically investigating population genetics models of recombination, migration and selection, we demonstrate that stronger selection can slow down evolution on a perfectly smooth fitness landscape. Through simple analytical calculation, this apparently counter-intuitive result is shown to stem from two opposing effects of natural selection on the rate of evolution. On the one hand, natural selection tends to increase the rate of evolution by increasing the fixation probability of fitter genotypes. On the other hand, however, it tends to decrease the rate of evolution by decreasing the chance of recombination between immigrants and resident individuals. As a consequence of these opposing effects, there is a finite selection pressure maximizing the rate of evolution; hence, the change depends on the force non-monotonically.

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